

7 an updater that updates information in the partial copy [in response to] from
8 update information which the information source provides the server, the update
9 information being provided without intervention by the server when information in the
10 partial copy is updated in the information source.

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1 2. (amended) A server in a network that receives requests from users of the network for
2 information belonging to an information source to which the server has access,
3 the server comprising:

4 a partial copy of the information from which the server provides the requested
5 information when the requested information is contained therein and

6 an information fetcher that [does not automatically fetch information from the
7 information source to the partial copy when the information is not contained therein but
8 rather] fetches [the] information from the information source to the partial copy when the
9 information fetcher determines from dynamically-acquired request information that a
10 future request for particular information is probable, the request information being
11 information other than the fact that requested information is not in the copy [needed for a
12 probable future request].

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1 3. (amended) The server set forth in claim 2 wherein:

2 [the information fetcher makes a determination of what information is needed for
3 a probable future request on the basis of] the request information is information usage
4 information maintained in the server [and fetches information on the basis of the
5 determination].

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1 4. (amended) The server set forth in claim 2 wherein:

2 [the information fetcher receives a determination of what information is needed
3 for a probable future request] the request information is information received from a
4 source external to the server [and fetches information according to the determination].

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1 5. (amended) A server in a network that receives requests from users of the network for
2 information belonging to an information source that has access to the server,
3 the server comprising:

4 a partial copy of the information belonging to the information source from which the
5 server provides the information when the requested information is contained therein; and

6 an updater that updates the partial copy in response to update information which the
7 information source provides the server on the basis of a determination made at the
8 information source that a future request for the information in the update information is
9 probable [of a probable future request for information].

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1 6. (amended) An information source that has access to one or more servers in a network, each
2 server including a partial copy of the information in the information source and the
3 information source having the improvement comprising:

4 an updater that responds to an update of information in the information source that
5 is contained in the partial copy by providing the update to the server, the update being
6 provided without intervention by the server.

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1 7. The information source set forth in claim 6 wherein:

2 the information source is a database system of the type wherein trigger code may be
3 associated with the information, the trigger code being executed when the information is
4 updated; and

5 the updater is trigger code which is associated with information contained in the
6 partial copy, the trigger code responding to an update of the information by providing the
7 update to the server.

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1 **Please cancel claim 8**

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1 9. (amended) The information source set forth in either one of claim [8] 6 or claim 7

2 wherein:

3 the information source provides further information for the partial copy to the server in
4 response to a request from the server.

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1 10. (amended) The information source set forth in either one of claim [8] 6 or claim 7

2 wherein:

3 the information source provides [the] further information on the basis of a
4 determination made at the information source that a future request for the information is
5 probable [of a probable future request for information].

1 11. The information source set forth in claim 10 wherein the information source further
2 comprises:

3 a log of requests for information and

4 the information source makes the determination using the log of requests.

1 12. The information source set forth in claim 10 wherein:

2 the information source uses information about an event that will result in requests to
3 make the determination.

1 13. The information source set forth in claim 12 wherein:

2 the information source uses information about a time of occurrence of the event to
3 make the determination.

1 14. (amended) The information source set forth in claim [8] 6 or claim 7 wherein:

2 the information source provides further information for the partial copy to the server
3 on the basis of a determination made elsewhere that a future request for the information is
4 probable [of a probable future request for information].

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1 15. (amended) An information source that has access to one or more servers in a network,
2 each server including a partial copy of the information in the information source and the
3 information source having the improvement comprising:

4 an information sender that determines that a future request for the information is
5 probable [a probable future request for information] and provides the information for the
6 probable future request to the server.

1 16. (amended) The information source set forth in claim 15 wherein the information sender
2 further comprises:

3 a log of requests for information and
4 the information sender makes the determination that a future request for the
5 information is probable using the log of requests.

1 17. (amended) The information source set forth in claim 15 wherein:

2 the information sender uses information about an event that will result in requests to
3 make the determination that a future request for the information is probable.

1 18. (amended) The information source set forth in claim 17 wherein:

2 the information sender uses information about a time of occurrence of the event to
3 make the determination that a future request for the information is probable.

1 19. (amended) The information source set forth in claim 15 wherein:

2 the information source provides the information on the basis of a determination made
3 elsewhere that a future request for the information is probable [of a probable future request for
4 information].

1 20. (amended) A method employed by an information source to update a partial copy of the

2 information in the information source that is contained in a server accessible to the
3 information source,

4 the method comprising the steps of:

5 detecting a change in information in the information source that is also in a partial
6 copy; and

7 sending an update message indicating the change to the server, the update message
8 being sent without intervention by the server.

1 **21.** (amended) An improved middle-tier Web server of the type that has [an HTML] a web
2 page layer for providing [HTML] Web pages in response to URLs, a Web application
3 layer for providing data for the [HTML] Web pages [in response to messages
4 accompanying the URLs], and a data access layer that responds to a request [requests]
5 from the Web application layer by querying a remote dataset [datasets] of a plurality
6 thereof and returning a response to the query to the Web application layer,
7 the server having the improvement comprising:
8 a queryable cache containing copies of certain of the remote datasets,
9 the data access layer determining whether a copy of a dataset to be queried is present in
10 the queryable cache and if the copy is present, querying the copy, and otherwise querying the
11 remote data set.

1 **22.** (amended) The improved Web server set forth in claim [21] 48 wherein
2 the request [query] employs global identifiers for the remote data sets;
3 the copies are identified by local identifiers;
4 and the improvement further comprises:

5 a query analyzer which responds to a global identifier by returning an indication
6 whether the remote dataset identified by the global identifier has a copy in the cache and if the
7 remote dataset has a copy, returning the local identifier for the copy,
8 the data access layer responding to a returned indication that the remote dataset does not have a
9 copy by querying the remote data set and responding to a returned indication that the remote
10 dataset does have a copy by querying the queryable cache using the returned local identifier for
11 the copy.

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1 23. The improved Web server set forth in claim 22 wherein:

2 the data access layer provides a global query context including all of the global
3 identifiers used in the query to the query analyzer;

4 when there are copies of all of the remote datasets identified in the global query context,
5 the returned indication returned by the query analyzer so indicates and the query analyzer returns
6 a local query context including the local identifiers for the copies; and

7 the data access layer uses the local query context to query the queryable cache.

Sub D1
1 24. (amended) An improved [data access interface of the type used in a] server of the type that

2 provides [to provide] a program with a standard interface for querying remote datasets,
3 the improvement comprising:

4 a queryable cache that contains copies of certain of the datasets and is [accessible to the
5 data access interface] local to the server,

6 the improved [data access interface] server receiving a query for a remote dataset in a form
7 required by the interface from the [application] program, determining whether a copy of a dataset

8 to be queried is present in the queryable cache, and, if the copy is present, querying the copy,
9 and otherwise querying the remote dataset,
10 whereby the queryable cache is transparent to the program.

1 **25.** (amended) The improved [data access interface] server set forth in claim 24 wherein

2 the program uses global identifiers for the remote data sets and

3 the copies in the queryable cache have local identifiers; and

4 the improved [data access interface] server further comprises:

5 a query analyzer that receives the global identifier for a dataset being queried and if

6 there is a copy of the data set indicated by the global identifier, returns the local identifier to the

7 [data access interface] server,

8 the [data access interface] server using the local identifier to query the copy.

1 **26.** (amended) The improved [data access interface] server set forth in claim [24] 25 wherein:

2 the query analyzer further indicates to the [data access interface] server whether the copy

3 of the dataset is in the queryable cache.

1 **27.** (amended) The improved [data access interface] server set forth in claim 24 further

2 comprising:

3 a dataset manager that determines a dataset for which a copy is needed in the cache,

4 obtains a copy of the remote dataset, and adds the copy to the cache.

1 **28.** (amended) The improved [data access interface] server set forth in claim 27 wherein:

2 the dataset manager further determines a dataset for which a copy is no longer needed in
3 the cache and removes the copy from the cache.

1 29. (amended) The improved [data access interface] server set forth in any of claims 27 or 28
2 wherein:

3 the dataset manager [determine] determines whether to add or remove a dataset by
4 determining a [likeliness] likelihood that a query will be made to the dataset.

1 30. (amended) The improved [data access interface] server set forth in claim 29 wherein the
2 improved [data access interface] server further comprises:

3 a query log that lists past queries that have been made to the standard interface and
4 the dataset manager uses the query log to determine a [likeliness] likelihood that a query
5 will be made to a dataset.

1 31. (amended) The improved [data access interface] server set forth in claim 29 wherein:
2 the dataset manager uses information about an event that will result in queries to a
3 dataset to determine a [likeliness] likelihood that a query will be made to a dataset.

1 32. (amended) The improved [data access interface] server set forth in claim 31 wherein:
2 the dataset manager uses information about a time of occurrence of the event to
3 determine a [likeliness] likelihood that a query will be made to a dataset.

1 33. (amended) The improved [data access interface] server set forth in claim 24 wherein

2 when a change occurs in a remote dataset of the remote datasets , an indication [of]
 3 including the change is sent to the server without intervention by the server and
 4 the improved [data access interface] server further comprises:
 5 an update receiver that receives the indication and modifies any copy of the changed
 6 dataset as required by the indication.

1 **34.** (amended) A method of querying datasets in a server that [using a data access interface in a
 2 server to query remote datasets, the data access interface being of a type that] provides a
 3 standard interface for querying [the] remote data sets to a program executing on the
 4 server [and the data access interface having access to a queryable cache that contains
 5 copies of certain of the remote datasets and]
 6 the method comprising the steps of:
 7 receiving a query for a remote dataset in a form required by the standard interface;
 8 determining whether a copy of a dataset to be queried is present in [the] a queryable
 9 cache local to the server; and
 10 if the copy is present in the queryable cache, querying the copy and otherwise querying
 11 the remote dataset,
 12 whereby the queryable cache is transparent to the program.

1 **35.** The method set forth in claim 34 wherein
 2 the [program] form required by the standard interface uses global identifiers for the
 3 remote data sets and
 4 the copies in the queryable cache have local identifiers; and

5 the method further includes the steps of :

6 [receiving] providing the global identifier for a dataset being queried to a query analyzer

7 in the server; and

8 if there is a copy of the data set indicated by the global identifier, [returning] receiving

9 the local identifier from the query analyzer [to the data access interface],

10 the local identifier being used in the step of querying the local copy.

Please add the following new claims 36-75.

1 --36. A method employed in a server in a network, the server receiving requests from
2 users of the network for information belonging to an information source that has access to
3 the server and the server having a partial copy of the information belonging to the
4 information source,

5 the method serving to update the partial copy and comprising the steps of:

6 receiving update information which the information source provides without
7 intervention by the server when information in the partial copy is updated in the
8 information source; and

9 updating the information in the partial copy from the update information.

1 37. A method employed in a server in a network, the server receiving requests from users
2 of the network for information belonging to an information source to which the server has
3 access and the server having a partial copy of the information belonging to the
4 information source,

5 the method serving to update the partial copy and comprising the steps of:

6 dynamically acquiring request information other than the fact that the requested
7 information is not in the copy;
8 determining from the acquired request information that a future request for
9 particular information is probable; and
10 obtaining the particular information from the information source.

1 **38.** The method set forth in claim 37 wherein:

2 the request information is information usage information maintained in the server.

1 **39.** The method set forth in claim 37 wherein:

2 the request information is information received from a source external to the
3 server.

1 **40.** A method employed in a server in a network, the server receiving requests from users
2 of the network for information belonging to an information source that has access to the
3 server and the server having a partial copy of the information belonging to the
4 information source,

5 the method serving to update the partial copy and comprising the steps of:

6 receiving update information which the information source provides the server on
7 the basis of a determination made at the information source that a future request for the
8 information in the update information is probable; and

9 updating the information in the partial copy from the update information.

1 **41.** The method set forth in claim 20 wherein:

2 the information source is a database system of the type wherein trigger code may
3 be associated with the information, the trigger code being executed when the information
4 is updated and

5 the step of sending an update an update message is performed by the trigger code.

1 **42.** The method set forth in either of claims 20 or 41 further comprising the step of:

2 sending further information for the partial copy to the server in response to a
3 request from the server.

1 **43.** The method set forth in either of claims 10 or 42 further comprising the steps of:

2 making a determination at the information source that a future request for further
3 information is probable; and

4 sending the further information for the partial copy to the server in response to the
5 determination.

1 **44.** The method set forth in claim 43 wherein:

2 the step of making a determination is performed using a log of requests in the
3 information source.

1 **45.** The method set forth in claim 43 wherein:

2 the step of making a determination is performed using information about an event
3 that will result in requests.

1 **46.** The method set forth in claim 45 wherein:
2 the information source uses information about a time of occurrence of the event to
3 make the determination.

47. The method set forth in either of claims 20 or 41 further comprising the step of:
 receiving in the information source a determination that is made elsewhere that a
future request for the information is probable.

1 **48.** The middle-tier Web server set forth in claim 21 wherein:
2 the request is in a form usable for querying the remote dataset.

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1 **49.** A method practiced in a middle-tier Web server of the type that has a web page layer
2 for providing Web pages in response to URLs, a Web application layer for
3 providing data for the Web pages, and a data access layer that responds to a
4 request from the Web application layer by querying a remote dataset of a
5 plurality thereof and returning a response to the query to the Web application
6 layer,
7 the method comprising the steps performed in the data access layer of:
8 determining from the request whether a copy of the dataset to be queried is
9 present in a queryable cache local to the Web server; and
10 if the copy is present, querying the copy and otherwise querying the remote data
11 set.

1 **50.** The method set forth in claim 49 wherein:

2 the request is in a form usable for querying the remote dataset.

1 **51.** The method set forth in claim 50 wherein

2 the remote datasets are identified by global identifiers;

3 the copies are identified by local identifiers;

4 the request employs a global identifier for identifying the remote dataset; and

5 the method further comprises the steps performed in the data access layer of:

6 using the global identifier to determine whether a copy of the remote dataset is in
7 the cache; and

8 if the copy is present, receiving a local identifier for the copy from the cache; and

9 using the local identifier to query the copy.

1 **52.** The method set forth in claim 51 wherein:

2 the remote data set is identified by a global context containing one or more of the
3 global identifiers; and

4 the copy is identified by a local query context containing one or more of the local
5 identifiers;

6 in the step of using the global identifier, the global context is used; and

7 in the step of using the local identifier, the local context for the copy is returned

8 and is used to query the copy.

Sub D2 53. The method set forth in claim 35 further comprising the step of:

2 receiving an indication from the query analyzer whether the copy is present in the
3 queryable cache.

1 **54.** The method set forth in claim 34 further comprising the steps of:

2 determining a dataset for which a copy is needed in the cache;

3 obtaining the copy; and

4 adding the copy to the cache.

1 **55.** The method set forth in claim 54 further comprising the steps of:

2 determining a dataset for which a copy is no longer needed in the cache; and

3 removing the copy from the cache.

1 **56.** The method set forth in any one of claims 27 or 28 wherein:

2 the step of determining a dataset is performed by determining a likelihood that a
3 query will be made to the dataset.

1 **57.** The method set forth in claim 56 wherein:

2 in the step of determining a dataset, a query log that lists pasts queries is used to
3 determine the likelihood that a query will be made.

1 **58.** The method set forth in claim 56 wherein:

2 in the step of determining a dataset, information about an event that will result in
3 queries to a dataset is used to determine the likelihood that a query will be made.

59. The method set forth in claim 58 wherein:

in the step of determining a dataset, information about a time of occurrence of the event is used to determine the likelihood that a query will be made.

60. The method set forth in claim 34 wherein

when a change occurs in a remote dataset of the remote datasets, an indication including the change is sent to the server without intervention by the server and the method further comprises the steps of:

receiving the indication and modifying any copy of the changed dataset as required by the indication.

61. A memory device characterized in that:

the memory device contains code which, when executed by a processor, performs a method employed in a server in a network, the server receiving requests from users of the network for information belonging to an information source that has access to the server and the server having a partial copy of the information belonging to the information source and

the method serving to update the partial copy and comprising the steps of:

receiving update information which the information source provides without intervention by the server when information in the partial copy is updated in the information source; and

updating the information in the partial copy from the update information.

1 **62.** A method employed in a server in a network, the server receiving requests from users
2 of the network for information belonging to an information source to which the server has
3 access, the server having a partial copy of the information belonging to the information
4 source, and

5 the method serving to update the partial copy and comprising the steps of:

6 dynamically acquiring request information other than the fact that the requested
7 information is not in the copy;

8 determining from the acquired request information that a future request for
9 particular information is probable; and

10 obtaining the particular information from the information source.

1 **63.** A memory device characterized in that:

2 the memory device contains code which, when executed by a processor, performs
3 a method employed in a server in a network, the server receiving requests from users of
4 the network for information belonging to an information source that has access to the
5 server and the server having a partial copy of the information belonging to the
6 information source,

7 the method serving to update the partial copy and comprising the steps of:

8 receiving update information which the information source provides the server on
9 the basis of a determination made at the information source that a future request for the
10 information in the update information is probable; and

11 updating the information in the partial copy from the update information.

1 64. A server that is used in a network to provide a first object in response to a network
2 handle defined by the network, the first object incorporating information from a
3 remotely-stored particular second object of a plurality of second objects, and
4 the server comprising:

5 a first object providing component that provides the first object in response to the
6 network handle;

7 a data access component that obtains the information from the particular second
8 object and provides the information to the first object providing component; and

9 a cache local to the server, the cache containing copies of one or more of the
10 second objects and responding to specifiers for the second objects that are not network
11 handles,

12 the data access component using a specifier for the particular second object to obtain the
13 information from the cache if a copy of the particular second object is contained in the
14 cache and otherwise obtaining the information from the remotely-stored particular second
15 object.

1 65. The server set forth in claim 64 wherein:

2 the first object providing component provides the specifier for the information to
3 the data access component.

1 66. The server set forth in claim 65 wherein:

2 the specifier further specifies the information in the particular remotely-stored
3 particular second object; and

4 the data access component further uses the specifier to obtain the information
5 from the particular remotely-stored particular second object when there is no copy of the
6 particular second object in the cache,
7 whereby the cache is transparent to the first object providing component.

1 **67.** The server set forth in any one of claims 64 through 66 wherein:

2 the second objects are database objects; and

3 the specifiers are queries that access the database objects.

1 **68.** The server set forth in claim 67 wherein:

2 the server is a Web server, the network handle is a URL, and the first object is a
3 Web page.

1 **69.** The server set forth in claim 67 wherein:

2 the database objects are relational database objects.

1 **70.** A method employed in a server that is used in a network to provide a first object in

2 response to a network handle defined by the network, the first object incorporating

3 information from a remotely-stored particular second object of a plurality of second

4 objects, and

5 the method comprising the steps of:

6 using a specifier that is not a network handle to determine whether a copy of the
7 particular second object is in a cache that is local to the server and contains copies of one
8 or more of the second objects;

9 if the copy is in the cache, obtaining the information from the copy and otherwise
10 obtaining the information from the remotely-stored particular second object;

11 incorporating the obtained information into the first object; and

12 providing the first object.

1 **71.** The method set forth in claim 70 wherein:

2 the steps of incorporating the obtained information into the first object and
3 providing the first object are performed in an object-providing component of the server;

4 and

5 the method further comprises the step of:

6 receiving the specifier from the object-providing component.

1 **72.** The method set forth in claim 71 wherein:

2 the specifier further specifies the information in the remotely-stored particular
3 second object; and

4 in the step of obtaining the information, the specifier is used to obtain the
5 information from the remotely-stored particular second object,

6 whereby the cache is transparent to the object-providing component.

1 **73.** The method set forth in any one of claims 70 through 72 wherein:

1 the second objects are database objects; and
2 the specifiers are queries that access the database objects.

1 74. The method set forth in claim 73 wherein:

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2 the server is a Web server, the network handle is a URL, and the first object is a
3 Web page.

1 75. The method set forth in claim 73 wherein:

2 the database objects are relational database objects.--